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Changes in CO<sub>2</sub> emissions from China's energy-intensive industries: A subsystem input-output decomposition analysis

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1 Changes in CO<sub>2</sub> emissions from China's energy-intensive industries: A  
2 subsystem input-output decomposition analysis

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7 **Abstract**

8 This paper presents a subsystem input-output model to analyse the patterns behind the evolution of CO<sub>2</sub>  
9 emissions in energy-intensive industries. Two emissions accounting principles (the production  
10 accounting principle and the consumption accounting principle) are applied. The embodied CO<sub>2</sub>  
11 emissions are divided into the production-based CO<sub>2</sub> emissions associated with three components  
12 (internal component (IC), external component (EC) and demand level component (DLC)) in addition to  
13 the CO<sub>2</sub> emissions identified by the indirect component (INC) from a consumption perspective. A  
14 structural decomposition analysis is further conducted to decompose the emissions changes into 3  
15 effects, which are the emissions intensity effect (ET), the technological effect (TT) and the demand  
16 effect (DT). The results show that the external component is primarily responsible for increased CO<sub>2</sub>  
17 emissions and the demand effect is the key factor in the decrease of CO<sub>2</sub> emissions. Moreover, sectors  
18 with a positive difference between production-based and consumption-based emissions are more  
19 sensitive than the others to the technological changes. Thus, different measures should be adopted by  
20 considering sectorial realities.

21 **Keyword:** CO<sub>2</sub> emissions; Energy-intensive industry; Subsystem input-output model; Structural  
22 decomposition analysis

23 **Highlights**

- 24 ● The patterns behind the evolution of CO<sub>2</sub> emissions in China's energy-intensive industries are  
25 analysed from both production and consumption perspectives.
- 26 ● A subsystem input-output decomposition analysis is employed to explore the factors behind CO<sub>2</sub>  
27 emissions changes in China's energy-intensive industries.
- 28 ● The pulling effect of non-energy intensive industries on the CO<sub>2</sub> emissions in energy-intensive  
29 industries is discussed.
- 30 ● The policy implications of the results from China's energy-intensive industries are analysed.

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